National Institute of Environmental Health Sciences

Adaptive management for mitigating Cryptosporidium risk in source water: A case study in an agricultural catchment in South Australia

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Abstract:

Water-borne pathogens such as Cryptosporidium pose a significant human health risk and catchments provide the first critical pollution 'barrier' in mitigating risk in drinking water supply. In this paper we apply an adaptive management framework to mitigating Cryptosporidium risk in source water using a case study of the Myponga catchment in South Australia. Firstly, we evaluated the effectiveness of past water quality management programs in relation to the adoption of practices by landholders using a socio-economic survey of land use and management in the catchment. The impact of past management on the mitigation of Cryptosporidium risk in source water was also evaluated based on analysis of water quality monitoring data. Quantitative risk assessment was used in planning the next round of management in the adaptive cycle. Specifically, a pathogen budget model was used to identify the major remaining sources of Cryptosporidium in the catchment and estimate the mitigation impact of 30 alternative catchment management scenarios. Survey results show that earlier programs have resulted in the comprehensive adoption of best management practices by dairy farmers including exclusion of stock from watercourses and effluent management from 2000 to 2007. Whilst median Cryptosporidium concentrations in source water have decreased since 2004 they remain above target levels and put pressure on other barriers to mitigate risk, particularly the treatment plant. Non-dairy calves were identified as the major remaining source of Cryptosporidium in the Myponga catchment. The restriction of watercourse access of non-dairy calves could achieve a further reduction in Cryptosporidium export to the Myponga reservoir of around 90% from current levels. The adaptive management framework applied in this study was useful in guiding learning from past management, and in analysing, planning and refocussing the next round of catchment management strategies to achieve water quality targets.

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Resource Description

Exposure :

weather or climate related pathway by which climate change affects health

Food/Water Quality, Precipitation

Food/Water Quality: Pathogen

Geographic Feature:

resource focuses on specific type of geography

General Geographical Feature

Geographic Location: ☑

resource focuses on specific location

Non-United States

Non-United States: Australasia

Health Impact: ☑

specification of health effect or disease related to climate change exposure

Infectious Disease

Infectious Disease: Foodborne/Waterborne Disease

Foodborne/Waterborne Disease: Cryptosporidiosis

Intervention: ☑

strategy to prepare for or reduce the impact of climate change on health

A focus of content

Mitigation/Adaptation: ☑

mitigation or adaptation strategy is a focus of resource

Adaptation

Resource Type: ☑

format or standard characteristic of resource

Policy/Opinion, Research Article

Timescale: ☑

time period studied

Time Scale Unspecified

Vulnerability/Impact Assessment: ☑

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content